# 2010 MA334Q — SEMICONDUCTORS, ELECTRONIC COMPONENTS, AND SEMICONDUCTOR MANUFACTURING EQUIPMENT

## DEFINITIONS AND SPECIAL INSTRUCTIONS

**1. Scope of survey**

This survey covers the manufacture of semiconductors, printed circuit boards, connectors, capacitors, and other electronic components (except relays) and semiconductor machinery in the United States.

**2. Figures to be reported**

Companies with more than one establishment manufacturing the products covered by this survey are requested to complete a separate report form for each location. If you have not received a separate form for each of your establishments, please call the contact shown on the report form or write to the U.S. Census Bureau for additional forms.

**a. Value of Shipments**

The figures on value of shipments should include the physical shipments of all products sold, transferred to other establishments within your company, or shipped on consignment, whether for domestic or export sale. The value represents the net sales price, f.o.b. plant, to the customer or branch to which the products are shipped, net of discounts, allowances, freight charges and returns. Shipments to your own branches should be assigned the same value as comparable sales to unaffiliated customers, i.e., the value includes an appropriate allocation of company overhead and profit. Products bought and resold without further manufacture should not be included in shipments. The quantity of shipments is no longer collected.

*Shipments should include the following —*

Private brand units as well as your own company brand units.

*Leased machines and equipment* — For products leased or rented by your company, report the number and estimated value. The estimate should approximate the value of the products sold outright. If no such basis is available, you may use the valuation placed on these items for tax, insurance, or similar purposes.

*Do not include the following —*

Products manufactured for you by others.

Imports which are reshipped without further domestic manufacture.

*Your figure should include —*

Electronic components parts (integrated microcircuits, transistors, diodes, rectifiers, capacitors, resistors, coils, transformers, connectors, filters, etc.)

*(See Reference List for complete list of products collected on this survey.)*

*but exclude —*

Electric wiring devices should be reported on survey MA335K, "Wiring Devices and Supplies."

Home entertainment electronic equipment, such as home and automobile radio receivers, television receivers, phonographs, hi-fidelity components, consumer audio and video tape recorders, loud-speakers, microphones, ear phones, phonograph cartridges, and public address systems should be reported on survey MA334M, “Consumer Electronics.”

Analytical and optical instruments should be reported in MA334A, “Electromedical Equipment and Analytical Instructions.”

**a. Value of shipments–Continued**

Industrial process control instruments should be reported in MA334C, "Control Instruments."

Aeronautical, nautical, and navigational instruments should be reported in MA334D, "Defense, Navigational, and Aerospace Electronics."

Physical properties testing and nuclear radiation, detection, and monitoring instruments should be reported in MA334T, "Meters and Test Devices."

**b. Research and development**

Dollar shipments should reflect income from development, design, and engineering services performed by the reporting plant in connection with the manufacture of the products shipped, whether included in a single production contract, or contracted for separately, but intended as preparation for the manufacture of the specific products.

**c. Columnar structure of report**

When entering your figures on the report form, please be sure to report the information in the correct columns as follows:

*Column 1* — Quantity, no longer collected
*Column 2* — Value (report shipments in thousands of dollars. Example: $1,000,000, report as $1,000)

**3. Definitions**

The product detail for this survey, as shown in the Reference List, is defined according to standard nomenclature for this industry.

**SEMICONDUCTOR MACHINERY** (Item codes 5201–5229)—This industry is comprised of establishments engaging in the manufacturing of wafer processing equipment, semiconductor assembly and packaging equipment, and other semiconductor making machinery.

**TRANSMITTING, INDUSTRIAL, AND SPECIAL PURPOSE ELECTRON TUBES** (Item codes 5747–6015)— Power and special purpose tubes include:

**High vacuum tube** — An electronic device in which conduction by electrons takes place through a vacuum within a sealed container and which is used for amplification, generation, control, or conversion of electromagnetic energy.

**Triode** — A three-electrode tube whose defining elements are a cathode for the emission of electrons, an anode for the collection of said electrons, and an inter- interspersed grid for controlling or regulating the number of electrons (current) that flow between cathode and anode.

**Diode** — An electron tube whose defining elements are a cathode for the emission of electrons, and an anode for the collection of said electrons.

**Anode** — The positive electrode through which a principal stream of electrons leaves the interelectrode space in an electron tube.

**Gas and vapor tube** — An electron tube in which the contained gas or vapor performs the primary role in the operation of the tube.

**Thyratron** — A hot cathode gas tube in which one or more control electrodes initiate but do not limit the anode current except under certain operating conditions.

**Microwave tube** — An electron tube designed for operation at wavelengths in the range of about 30 to 0.1 cm.

**Klystron** — A velocity-modulated tube comprising an input resonator, a drift space, and one or more intermediate or output resonators separated by appropriate drift spaces.

**Amplifier** — A klystron with two or more cavities uncoupled except by the beam, designed primarily for power amplification or generation. Also called power klystron.

**Reflex** — A single-resonator oscillator klystron in which the electron beam is reversed by a negative electrode so that it passes twice through the resonator, thus providing feedback.

**Magnetron** — A two-electrode electron tube with a resonant anode structure in which the flow of electrons to the anode is controlled by a combination of crossed steady electric and magnetic fields in such a way as to produce microwave output.

**Tunable** — A magnetron that can be tuned over a range of frequencies by electronic or mechanical means.

**Traveling wave tube** (TWT) — An electron tube in which a stream of electrons interacts continuously or repeatedly with a guided electromagnetic wave moving substantially in synchronism with it, and in such a way that there is a net transfer of energy from the stream to the wave.

**3. Definitions — Continued**

**TRANSMITTING, INDUSTRIAL, AND SPECIAL PURPOSE ELECTRON TUBES** *(Item codes 5747—6015)* **— Continued**

**Forward wave**—A wave whose group velocity is in the same direction as the electron in stream motion.

**Continuous wave (CW)**—A mode of operation in which the radio frequency (RF) output energy is not interrupted.

**Pulsed power**—The mode of operation in which an RF source is successfully turned on and off to provide repetitive pulses of high RF power.

**Backward wave**—A wave whose group velocity is opposite to the direction of electron stream motion.

**Camera tube** — A tube for conversion of an optical image into an electrical signal.

**Photoemissive** — Consists of a glass or quartz tube containing two electrodes, of which the cathode is coated with a layer of photosensitive material; under the action of the light, this layer emits electrons which establish conductibility between the electrodes and are collected on the anode. Also called photoemissive cell.

**Image intensifier**—An electronic tube in which an image projected on to a photoemissive surface produces a corresponding intensive image on a luminescent surface.

**Image converter**—An electron tube reproduces on its fluorescent screen an image of the optical image or other irradiation pattern incident on its photosensitive surface.

**Photomultiplier**—Photosensitive vacuum tubes comprising a photoemissive cathode and an electron multiplier.

**Storage tube**—An electron tube into which information can be introduced and read at a later time.

**Cathode ray tube (CRT)**—A display device in which controlled electron beams are used to present alphanumeric or graphical data on an electro-luminescent screen.

**Special display device** — A CRT that forms alphanumeric and symbolic characters on its screen for viewing or recording purposes.

**CATHODE-RAY PICTURE & RECEIVING TUBE** (Item code 6005)—A cathode ray tube (CRT) used for display purposes to produce an image by varying the electron beam intensity as the beam or beams is deflected to form a prescribed raster.

**ELECTRON TUBE PARTS, EXCEPT GLASS BLANKS** (item code 6015)— An electron device used in old time receiving sets in which conduction of electricity is provided by electrons moving through a vacuum of gaseous medium within a gastight envelope.

**INTEGRATED MICROCIRCUIT PACKAGES**
*(Item codes 6201—6300)*

**Integrated circuit (IC)** — A microcircuit consisting exclusively of elements formed in situ on or within a single semiconductor substrate, with at least one of the elements formed within the substrate.

**Hybrid microcircuit** — A microcircuit consisting of elements that are a combination of one or both of these with discrete parts.

**Monolithic IC** — An IC consisting exclusively of elements formed in situ on or within a single semiconductor substrate with at least one of the elements formed within the substrate.

**Bipolar IC** — Semiconductor device used mostly as logic circuits.

**Transistor-transistor logic (TTL)** — A kind of bipolar circuit logic which takes its name from the way the basic transistor components are interconnected.

**Current-mode logic (CML) or emitter-coupled logic (ECL)** — Logic in which transistors operate in the unsaturated mode as distinguished from most other logic types which operate in the saturation region. Has very fast switching speeds and low logic swings.

**Integrated injection logic (IIL)** — It is made with a five mask process without the need for current source and load resistors, and can handle digital and analog functions on a single chip.

**Microprocessor** — An IC capable of:

1. operation on coded instructions.
2. carrying out, in accordance with the instructions, all of:

**INTEGRATED MICROCIRCUIT PACKAGES** *(Item codes 6201—6300)* **— Continued**

**Microprocessor — Continued**

**(a)** the acceptance of coded data for processing and/or storage,

**(b)** arithmetic and logical operations on the input data together with any relevant data stored in the internal registers of the microprocessor IC and/or in external memories,

**(c)** the delivery of coded data.

**3.** Accepting and/or delivering signals controlling and/or describing the operation or state of the microprocessor IC.

**Memory** — An IC consisting of memory cells and usually including associated circuits such as those for address selection and amplification.

**Random access memory (RAM)** — A memory in which access to all storage data can be achieved in essentially the same time, independent of the location. In a multipart memory, this term refers to that portion of the array which contains the memory cell array and its drivers, sense amplifiers, and control circuitry associated with the normal random access data port.

**Read only memory (ROM)** — A memory in which the contents are not intended to be altered during normal operation.

**Metal oxide semiconductor (MOS) IC** — A subcategory of MIS, in which the insulator employed is an oxide of the semiconductor substrate material. The term MOS is often misused to include other categories of insulated- gate technology such as MIS, MNS, and silicon gate (SIS).

**MOS memory**—A memory using a semiconductor circuit; generally used in high speed buffer memory and ROM.

**Dynamic random access memory (DRAM)**— These devices are made using dynamic RAM circuit configuration that have data storage that must be refreshed periodically. Also, a read/write memory in which the cell requires the repetitive application of control signals generated inside or outside the IC in order to retain stored data.

**Static random access memory (SRAM)**—A read/write memory in which the data is retained in the absence of control circuits generated inside or outside the IC.

**Metal-oxide silicon read-only memory (MOSROM)**—A ROM storage medium that employs metal-oxide silicon transistor (MOST) cells to store binary 1s and 0s.

**Erasable programmable ROM (EPROM)**—A reprogrammable read-only memory in which all cells may be simultaneously erased using ultraviolet light and in which each cell may be reprogrammed electrically.

**Electrically erasable programmable ROM (EEPROM)**— A reprogrammable read-only memory in which cells may be erased electrically and in which each cell may be reprogrammed electrically.

**TRANSISTORS** *(Item code 6305)*

**Transistor**—A semiconductor device capable of providing power amplification and having three or more electrodes.

**Signal transistor**—Device capable of being used up to half a watt.

**Power transistor**—Device capable of being used at high power ratings.

**DIODES and RECTIFIERS** *(Item code 6317)*

**Diode**—A semiconductor device having two electrodes and exhibiting a nonlinear voltage-current characteristic, used for detection, rectification, switching, etc.

**Semiconductor rectifier diode**—A semiconductor device that has two electrodes, exhibits an asymmetrical voltage-current characteristic, and is used for current and voltage rectification.

**Zener Diode**—Alternative name used for voltage-reference diode or the voltage regulator diode.

**Voltage reference diode**—A diode that is normal biased to operate in the breakdown region of its voltage-current characteristic and that develops across its terminal a reference voltage of specific accuracy when biased to operate throughout a specified current and temperature range.

**Rectifier**—A device that converts alternating current into a current having a large unidirectional component, such as gas tube, metallic rectifier, semiconductor diode, or vacuum tube.

**Selenium rectifier**—A device whose essential characteristics are governed by the flow of charge carried within a semiconductor.

**SEMICONDUCTORS** ***(Item codes 6328–6499)***

**Semiconductor device**—A device whose essential characteristics are governed by the flow of charge carried within a semiconductor.

**MA334Q DEFINITIONS AND SPECIAL INSTRUCTIONS — Definitions Continued**

**SEMICONDUCTORS** *(Item codes 6328–6499)*—Continued

**Semiconductor device — Continued**

**Solar cell**—A photoelectric cell used to convert the radiant energy of the sun into electric power.

**Photovoltaic module**—A photovoltaic device for generating electricity that is packaged for electrical interface with other electrical equipment.

**Light-emitting diode (LED)**—A diode capable of emitting luminous energy resulting from the recombination of electrons and holes.

**Photodiode**—A semiconductor diode in which the reverse current varies with illumination.

**Photovoltaic cell**—Converts light directly into electrical energy without the need for an external source of current. Used mainly in luxmeters and exposure meters.

**Thyristor**—A bistable semiconductor device that comprises three or more junctions and can be switched from the off state to the on state or vice versa. NOTE: The term thyristor is used as a generic term to cover the whole range of pnpn-type switches. It may be used by itself for any member of the thyristor family when such use does not result in ambiguity or misunderstanding. In particular, the abbreviated term "thyristor" is widely used for the reverse-blocking triode thyristor alternately called "silicon controlled rectifier" or "semiconductor controlled rectifier."

**Chip** — A separated part (or whole) of a wafer intended to perform a function or functions in a device.

**Wafer**—A slice or flat disk, either of semiconductor material or of such a material deposited on a substrate, in which one or more circuits or devices are simultaneously processed and that subsequently may be separated into chips.

**CAPACITORS** *(Item codes 6767—6797)*

**Capacitor**—A device consisting essentially of two conducting surfaces separated by a dielectric material such as air, paper, mica, ceramic, glass, or Mylar. A capacitor stores electric energy, blocks the flow of direct current, and permits the flow of alternating current to a degree dependent on its capacitance and frequency. This includes the following:

**Fixed capacitor**—A capacitor having a definite capacitance value that cannot be adjusted.

**Paper capacitor**—A fixed capacitor consisting of two strips of metal foil separated by oiled or waxed paper or other insulating material, and commonly rolled together in compact tubular or other form.

**Metallized paper capacitor**—A paper capacitor in which a film of metal is deposited directly on the insulating paper to serve in place of a separate foil strip.

**Dual (film/paper) dielectric capacitor**—A dielectric (a material that can serve as an insulator because it has poor electric conductivity) plastic film and paper are used between metal-foil plates of a capacitor to separate the plates electrically and store electric energy.

**Tantalum electrolytic capacitor**—An electrolytic capacitor that uses tantalum in the form of foil or a sintered slug as the anode, in an acid base electrolyte.

**Aluminum electrolytic capacitor**—An electrolytic capacitor that uses plain or etched aluminum foil for both electrodes.

**Ceramic dielectric capacitor**—A capacitor whose dielectric is a ceramic material such as steatite or barium titanate, the composition of which can be varied to give a wide range of temperature coefficients.

**Mica dielectric capacitor**—A fixed capacitor that uses mica sheets as the dielectric.

**Variable capacitor**—A capacitor whose capacitance can be varied by moving one set of metal plates with respect to another.

**RESISTORS** *(Item codes 6885—6896)*

**Resistor**—A device designed intentionally to have a definite amount of electrical resistance. Used in circuits to limit current flow or to provide a voltage drop. This includes the following:

**Fixed carbon resistor**—A resistor that has no provision for varying its resistance value and consisting of particles mixed with a binder, usually molded into a cylindrical shape, and baked.

**Variable resistor**—A resistor whose value may be changed readily by means of a control knob to control the current in a circuit. It has one fixed terminal and one that is connected to the sliding or rolling contact. Also called a rheostat.

**Wirewound resistor**—A resistor employing as the resistance element a length of high-resistance wire or ribbon, usually Nichrome, wound on an insulating form.

**Potentiometer**—Resistor having a continuously adjustable sliding contact that is generally mounted on a rotating shaft. Used chiefly as a voltage divider.

**Varistor**—A two-electrode semiconductor device having a voltage-dependent non linear resistance. Resistance drops as the applied voltage is increased.

**3. Definitions — Continued**

**RESISTORS — Continued**

**Thermistor**—A bolometer that makes use of the change in resistivity of a semiconductor with change in temperature.

**COILS, TRANSFORMERS, REACTORS, AND CHOKES FOR ELECTRONIC APPLICATIONS** *(Item code 6967)*

**Coil**—A number of turns a wire used to introduce inductance into an electric circuit, to produce magnetic flux, or to react mechanically to a changing magnetic flux.

**Radio frequency (RF) coil**—A coil having one continuous untapped winding, specifically designed to furnish inductive reactance for tuning purposes in a circuit carrying RF current.

**Toroidal winding**—One or more turns of wire wound on a doughnut-shape core forming a continuous coil for a transformer, relay, rotating machine, or other electrical device.

**Transformer**—A component consisting of two or more coils that are coupled together by magnetic induction. Used to transfer electric energy from one or more circuits without change in frequency but usually with changed values of voltage and current.

**Audio transformer or audio frequency (AF) transformer** —An iron-core transformer used for coupling between AF circuits.

**Filament transformer**—A small transformer used exclusively to supply filament or heater current for one or more electron tubes.

**Pulse transformer**—A transformer capable of operating over a wide range of frequencies, used to transfer nonsinusoidal pulses without materially changing their wave-forms.

**Intermediate-frequency (IF) transformer**—The transformer used at the input and output of each IF amplifier stage in a superheterodyne receiver for coupling purposes and to provide selectivity.

**Reactor**—A device that introduces either inductive or capacitive reactance into circuits, such as a coil or capacitor.

**Choke**—An inductance used in a circuit to present a high impedance to frequencies above a specified frequency range without appreciably limiting the flow of direct current.

**RF choke**—An RF coil designed and used specifically to block the flow of RF current while passing lower frequencies or direct current.

**CONNECTORS** *(Item codes 7007—7087)*—A complete electric connecting device, consisting of a mating plug and receptacle for cables, or of mechanically mating flanges for waveguides.

**CRYSTALS, FILTERS, PIEZOELECTRIC, AND OTHER RELATED DEVICES** *(Item Codes 7153—7189)*

**FILTERS** *(Item code 7153)*

**Filter** — A selective that transmits a desired range of matter or energy while substantially attenuating all other ranges. This includes the following:

**Mechanical filter**—A filter designed to separate mechanical waves of different frequencies.

**Radio frequency interference/electromagnetic interference (RFI/EM) control filter**—A filter designed to separate unwanted interference of electromagnetic radiation of radio frequency signals into operating circuits.

**Electronic wave filter** — A transducer for separating waves on the basis of their frequency.

**PIEZOELECTRIC DEVICES** *(Item code 7187)*

**Piezoelectric device**—A device having the ability to generate a voltage when mechanical force is applied, or producing a mechanical force when a voltage is applied. This includes the following:

**Oscillator crystal**—A quartz crystal that has been cut and polished and which is used to generate a reference frequency in various types of instruments.

**Crystal oscillator**—An oscillator in which the principal frequency-determining factor is the mechanical resonance of a piezoelectric crystal.

**Crystal filter**—A electric wave filter employing piezoelectric crystals for its reactive elements.

**Crystal blank**—The result of the final cutting operation on a natural crystal.

**TRANSDUCERS** *(Item codes 8402—8599)*

**Transducer**—A device that converts energy from one form to another, as from acoustic energy to electric or mechanical energy.

**3. Definitions — Continued**

**TRANSDUCERS** *(Item codes 8402—8599)* **— Continued**

**Electroacoustic transducer**—A transducer for receiving waves and delivering waves to an acoustic system, or vice versa.

**Electromechanical transducer**—A transducer for receiving waves from an electric system and delivering waves to a mechanical system, or vice versa.

**Thermoelectric device**—A generic term for thermoelectric heat pumps (a device that transfers thermal energy from one body to another by the direct interaction of an electric current and heat flow) and thermoelectric generators (a device that converts thermal energy into electric energy by direct interaction of a heat flow and the charge carried in electric circuit which requires the existence of a temperature difference in the electric circuit).

**PRINTED CIRCUIT BOARD** *(Item codes 8602—8639)* — An insulating board serving as a base for a printed circuit. It may include printed components as well as printed wiring, completely processed as far as the printed portion is concerned.

**SWITCHES** *(Item code 8729)*

**Switch (electronic)**—An electronic device that directs the flow of electrical or optical signals from one side to the other. This includes the following:

**Toggle switch**—A small switch that is operated by manipulation of a projecting lever that is combined with a spring to provide a snap action for opening or closing a circuit quickly.

**Slide switch**—A switch that is actuated by sliding a button, bar, or knob.

**Rotary selector switch**—A switch that is operated by rotating its shaft.

**Keyboard switch**—A primary switch on various control panels which when pressed or activated will cause the first part or step of a program cycle or a procedure to begin.

**Pushbutton**—A master switch that is operated by finger pressure on the end of an operating button.

**Snap-action switch**—A switch that responds to very small movements of its actuating button or lever, and changes rapidly and positively from one contact position to the other. Also called a sensitive switch.

**Thumbwheel switch**—A rigid circular ring type switch actuated by finger pressure on a control panel.

**PRINTED CIRCUIT ASSEMBLY** *(Item codes 8740—8799)* —Loaded circuit boards and board assemblies for replacement, upgrade, further assembly, or installation in another computer system (including single board computers), by electronics manufacturing services providers/contract assembly companies.

**Computer and peripheral printed board assemblies**—End use includes: mini-computers, business, personal, mainframes, laptops, key and non-key input, printers, plotters, CRT terminals.

**Communications printed board assemblies**—End use includes: central office switching equipment transmitters, airborne radio, facsimiles, voice recognition, voice output, modems, carrier inter-faces, LAN'S, land mobile, amateur radio, fixed station, microwave, TV broadcast, radio broadcast, terrestrial/satellite navigation, cable tv (CATV), pagers, smoke/intrusion detectors.

**Industrial process control board assemblies**—End use includes: controllers, nuclear reactors, inspection and test, energy management, pollution monitoring, temperature controls, geophysical, meteorological, particle escalators, robotics, semiconductor testing.

**Instrumentation printed board assemblies, except industrial process**—End use includes: test and measurement, oscilloscopes, field recorders, automated test equipment (ATE), auto diagnostics, medical instrumentation, diagnostics, therapeutics, radiology, chronomotagraphs, spectrophotometers, electromechanical analyzers, lasers, avionics instrumentation.

**Search and detection printed board assemblies**—End use includes: radar tracking, guidance control, airborne/marine ground military communication, electronic warfare, jammers, warning receivers, electro-optics, sonar system surface, sonar sub-surface.

**Consumer electronics printed board assemblies**—End use includes: radios, television, audio equipment, musical instruments, video players, electronic games, garage door openers, home appliances, watches, clocks, personal electronics, cameras.

**Other electronics printed board assemblies**—End use includes: Calculators, copying machines, cash registers, electronic gaming, gas pump meters, point-of-sale terminals, and plotter controllers.

**3. Definitions — Continued**

**MICROWAVE COMPONENTS AND DEVICES** *(Item codes 8805—8859)*—This includes the following:

**Attenuator**—An arrangement of fixed and variable resistive elements used to reduce the strength of an RF or AF signal by a desired adjustable amount without introducing appreciable distortion.

**Cavity**—A resonator formed by a volume of propagating medium bounded by reflecting surfaces.

**Coupler**—A component used to transfer energy from one circuit to another.

**Coaxial switch**—A switch used with and designed to simulate the critical electric properties of coaxial conductors.

**Waveguide switch**—A switch designed for mechanically positioning a waveguide section so as to couple it to one of several other sections in a waveguide system.

**Rigid waveguide**—An inflexible rectangular or circular metal pipe having a predetermined cross-section, specifically designed to guide or conduct high-frequency electromagnetic waves through its interior, or any other equivalent system of material boundaries capable of guiding waves.

**Flexible waveguide**—A waveguide that can be bent or twisted without appreciably changing its electrical properties.

**Parametric amplifier**—A microwave amplifier having as its basic element an electron tube or solid-state device whose reactance can be varied periodically by an AC voltage at a pumping frequency.

**Solid state assemblies**—A number of basic parts or subassemblies, or any combination thereof, joined together to perform a specific function whose operation depends on the control of electric or magnetic phenomena in solids.

**OTHER ELECTRONIC COMPONENTS** *(Item codes 9712—9819)*

**Magnetic recording head** — A magnetic head used to transform electric variations into magnetic variations for storage on magnetic media.

**Magnetic reproducing head** — A magnetic head used to convert magnetic variations on magnetic media into electrical variations.

**Delay line** — A device utilizing the time of wave propagation to produce a time delay of a signal.

**Oscillators**—An electronic circuit used to generate high frequency pulses.

**Static power supply converter** — Electronic devices for transforming electric power.

**Electronic cable harness and assembly** — An assembly of insulated wires of various lengths, bent to a pattern and tied together before installation in a piece of equipment.

**Cryogenic cooling device** — A device utilizing properties of materials near absolute-zero temperature.

**Liquid crystal display (LCD)** — A display made of material whose reflectance or transmittance changes when an electric field is applied.

**Magnetic core** — A quantity of ferrous material placed in a coil or transformer to provide a better path than air for magnetic flux, thereby increasing the inductance of the coil and increasing the coupling between the windings of a transformer. Also called a core.

**Socket** — A device designed to provide electric connections and mechanical support for an electronic or electric component requiring convenient replacement.

**4. Comparability**

Data reported in this survey should correspond to data reported in the Annual Survey of Manufactures form. The sum of values for item codes shown in column (a) should correspond to dollar values reported under product class codes indicated in column (b) below.

| Current Industrial Reports (Form MA334Q) Item codes (a) | Annual Survey of Manufactures (Form MA-10000) Product class codes (b) |
|---|---|
| 5201 through 5228 | 3332950 |
| 5747 through 5917 | 3344111 |
| 6005 | 3344114 |
| 6015 | 3344117 |
| 6201 through 6298 | 3344131 |
| 6305 | 3344134 |
| 6317 | 3344137 |
| 6328 through 6450 | 334413A |
| 6767 and 6782 | 3344140 |
| 6885 and 6894 | 3344150 |
| 6967 | 3344160 |
| 7007 through 7084 | 3344170 |
| 7153 and 7187 | 3344191 |
| 8402 through 8597 | 3344194 |
| 8602 through 8632 | 3344120 |
| 8729 | 3344197 |
| 8740 through 8768 | 334418B |
| 8805 through 8850 | 334419A |
| 9712 through 9815 | 334419E |

## SEMICONDUCTORS, ELECTRONIC COMPONENTS, AND SEMICONDUCTOR MANUFACTURING EQUIPMENT

Table of Contents

## REFERENCE LIST

FORM **MA334Q—SEMICONDUCTORS, ELECTRONIC COMPONENTS, AND SEMICONDUCTOR MANUFACTURING EQUIPMENT**

| Product code | Item code | Item description |
|---|---|---|
| | | **SEMICONDUCTOR MACHINERY MANUFACTURING** *(Report value only)* |
| 3332950106 | **5201** | Semiconductor wafer processing equipment: thin layer chemical vapor deposition |
| 3332950211 | **5204** | Semiconductor wafer processing equipment: thin layer physical vapor deposition |
| 3332950326 | **5207** | Semiconductor wafer processing equipment: plasma etch |
| 3332950401 | **5210** | Microlithography, including aligners |
| 3332950416 | **5213** | Semiconductor wafer processing equipment: thin layer epitaxal growth deposition |
| 3332950421 | **5216** | Semiconductor wafer processing equipment: wet etch |
| 3332950441 | **5222** | Ion implantation, including current and voltage ion implanters |
| 3332950456 | **5225** | Wafer processing equipment: pattern generating apparatus |
| 3332950461 | **5227** | Other semiconductor wafer processing equipment |
| 3332950500 | **5228** | Parts for semiconductor manufacturing machinery, including packaging equipment |
| **3332950** | **5229** | **Total semiconductor machinery manufacturing** *(Sum of item codes 5201—5228) (Report value only)* |
| | | **TRANSMITTING, INDUSTRIAL, AND SPECIAL PURPOSE ELECTRON TUBES (EXCLUDE X-RAY)** *(Report value only)* |
| 3344111130 | **5747** | Power and special purpose electron tubes, except forward wave tubes |
| 3344111210 | **5827** | Forward wave transmitting and industrial electron tubes (excluding X-ray) |
| 3344111310 | **5917** | All other transmitting, industrial, and special purpose electron tubes, (excluding X-ray), including light sensing, light emitting devices, and miscellaneous special purpose tubes. |
| **3344111** | **5999** | Total transmitting, industrial, and special purpose electron tubes (sum of item codes 5747—5917) *(Report value only)* |
| **3344114100** | **6005** | Total cathode ray picture and receiving tubes *(Report value only)* |
| **3344117100** | **6015** | Total electron tube parts, except glass blanks *(Report value only)* |
| | | **INTEGRATED CIRCUIT PACKAGES** *(Report value only)* |
| 3344131550 | **6201** | Digital monolithic integrated circuits nonsilicon |
| 3344131552 | **6202** | Digital monolithic integrated circuits silicon |
| 3344131573 | **6204** | Volatile memory DRAMS, all sizes |
| 3344131580 | **6206** | Volatile memory SRAMS, all sizes |
| 3344131588 | **6238** | Nonvolatile EEPROM |
| 3344131581 | **6242** | NAND Type Flash EEPROM |
| 3344131593 | **6244** | NOR Type Flash EEPROM |
| 3344131589 | **6262** | Other Nonvolatile Memory |

FORM **MA334Q**

| Product code | Item code | Item description |
|---|---|---|
| | | **INTEGRATED CIRCUIT PACKAGES–Continued** |
| 3344131256 | **6264** | Single core microprocessors (MPU) |
| 3344131257 | **6266** | Multi-core microprocessors (MPU) operating with an external bus of 16 bits or less |
| 3344131260 | **6269** | Multi-core microprocessors (MPU) operating with an external bus of 32 bits or more |
| 3344131234 | **6270** | Microcontrollers (MCU) operating with an external data bus of 8 bits or less |
| 3344131235 | **6272** | Microcontrollers (MCU) operating with an external data bus of 16 bits |
| 3344131236 | **6274** | Microcontrollers (MCU) operating with an external data bus of 32 bits or greater |
| 3344131943 | **6278** | Complementary BiMOS |
| 3344131945 | **6280** | Other digital silicon IC's |
| 3344131910 | **6289** | Nondigital silicon monolithic IC's |
| 3344131YWV | **6290** | Hybrid IC's |
| 3344131912 | **6298** | Other IC packages |
| **3344131** | **6300** | **Total integrated circuit packages** *(Sum of item codes 6201 — 6298)* (*Report value only*) |
| **3344134100** | **6305** | **Total transistors** *(Report value only)* |
| **3344137100** | **6317** | **Total diodes and rectifiers** *(Report value only)* |
| | | **OTHER SEMICONDUCTOR DEVICES** *(Report value only)* |
| 334413A105 | **6328** | Solar cells |
| 334413A110 | **6333** | Photovoltaic modules |
| 334413A123 | **6344** | Light-emitting diodes (LED's) |
| 334413A137 | **6357** | Other light sensitive and light-emitting devices |
| 334413A140 | **6402** | Thyristors |
| 334413A150 | **6404** | Other semiconductor devices |
| 334413A154 | **6406** | Semiconductor parts: chips and wafers |
| 334413A165 | **6450** | All other semiconductor parts |
| **334413A** | **6499** | **Total other semiconductor devices** *(Sum of item codes 6328-6450) (Report value only)* |
| | | **CAPACITORS FOR ELECTRONIC CIRCUITRY** *(Report value only)* |
| 3344140173 | **6767** | Capacitors |
| 3344140175 | **6782** | Parts for capacitors |
| **3344140** | **6797** | **Total capacitors** *(Sum of item codes 6767 and 6782) (Report value only)* |
| | | **RESISTORS FOR ELECTRONIC CIRCUITRY** *(Report value only)* |
| 3344150182 | **6885** | Resistors |
| 3344150184 | **6894** | Parts for resistors |
| **3344150** | **6896** | **Total resistors** *(Sum of item codes 6885 and 6894) (Report value only)* |

**REFERENCE LIST — Continued**

FORM **MA334Q**

| Product code | Item code | Item description |
|---|---|---|
| 3344160100 | **6967** | **Total coils, transformers, reactors, and chokes for electronic applications** *(Report value only)* |
| | | **CONNECTORS FOR ELECTRONIC CIRCUITRY** *(Report value only)* |
| 3344170100 | **7007** | Coaxial connectors |
| 3344170400 | **7027** | Cylindrical connectors |
| 3344170700 | **7047** | Rack and panel connectors |
| 3344170A00 | **7063** | Printed circuit connectors |
| 3344170D17 | **7079** | Other connectors |
| 3344170D25 | **7084** | Parts for connectors |
| **3344170** | **7087** | **Total connectors** *(Sum of item codes 7007—7084) (Report value only)* |
| | | **CRYSTALS, FILTERS, PIEZOELECTRIC, AND OTHER RELATED DEVICES** *(Report value only)* |
| 3344191127 | **7153** | Filters (except microwave) |
| 3344191180 | **7187** | Piezoelectric devices |
| **3344191** | **7189** | **Total crystals, filters, piezoelectric, and other related devices** *(Sum of item codes 7153 and 7187) (Report value only)* |
| | | **TRANSDUCERS** *(Report value only)* |
| 3344194105 | **8402** | Transducers: electroacoustic |
| 3344194110 | **8452** | Transducers: accelerometers |
| 3344194115 | **8462** | Transducers: pressure |
| 3344194120 | **8472** | Transducers: strain gauges and other |
| 3344194135 | **8597** | Transducers: other |
| **3344194** | **8599** | **Total transducers** *(Sum of item codes 8402—8597) (Report value only)* |
| | | **BARE PRINTED CIRCUIT BOARD MANUFACTURING** *(Report value only)* |
| 3344120105 | **8602** | Printed circuit (wiring) boards: single-sided glass |
| 3344120110 | **8604** | Printed circuit (wiring) boards: Double-sided glass |
| 3344120115 | **8606** | Printed circuit (wiring) boards: Multilayer glass |
| 3344120120 | **8620** | Printed circuit (wiring )boards: Single-sided flex |
| 3344120125 | **8623** | Printed circuit (wiring) boards: Double-sided flex |
| 3344120130 | **8627** | Printed circuit (wiring) boards: Multilayer flex and rigid/flex |
| 3344120139 | **8632** | Printed circuit (wiring) boards: other |
| **3344120** | **8639** | **Total printed circuit (wiring) boards** *(Sum of item codes 8602-8632) (Report value only)* |

**REFERENCE LIST — Continued**

FORM **MA334Q**

| Product code | Item code | Item description |
|---|---|---|
| **3344197100** | **8729** | **Total switches for electronic circuitry** *(Report value only)* |
| | | **LOADED CIRCUIT BOARDS AND BOARD ASSEMBLIES** *(Report value only)* |
| 334418B105 | **8740** | Computer and peripheral printed board assemblies |
| 334418B110 | **8741** | Communications printed board assemblies |
| 334418B115 | **8742** | Industrial process control board assemblies |
| 334418B120 | **8743** | Instrumentation printed board assemblies, except industrial process |
| 334418B125 | **8744** | Search and detection printed board assemblies |
| 334418B130 | **8745** | Consumer electronics, printed board assemblies |
| 334418B137 | **8768** | Other printed board assemblies, subassemblies and modules, including office equipment and point of sales and plotter controllers |
| **334418B** | **8799** | **Total printed circuit assemblies** *(Sum of item codes 8740—8768) (Report value only)* |
| | | **MICROWAVE COMPONENTS AND DEVICES** *(Report value only)* |
| 334419A105 | **8805** | Ferrite (including yttrium garments) microwave components |
| 334419A110 | **8810** | Attenuators |
| 334419A125 | **8825** | Reactive microwave components |
| 334419A130 | **8830** | Switches, coaxial and waveguide |
| 334419A147 | **8847** | Other microwave devices |
| 334419A150 | **8850** | Microwave subassemblies |
| **334419A** | **8859** | **Total microwave components and devices except antennae, tubes, and semiconductors** *(Sum of item codes 8805-8850) (Report value only)* |
| | | **MISCELLANEOUS ELECTRONIC COMPONENTS** *(Report value only)* |
| 334419E125 | **9712** | Oscillators |
| 334119E130 | **9740** | Regulated static power supplies for electronic applications, sold separately |
| 334419E135 | **9745** | Other static power supplies |
| 334419E140 | **9750** | Electronic cable harnesses and cable assemblies |
| 334419E155 | **9770** | Magnetic cores |
| 334419E180 | **9815** | All other specialized electronic hardware |
| **334419E** | **9819** | **Total miscellaneous electronic components** *(Sum of item codes 9712—9815) (Report value only)* |

8/26/2010